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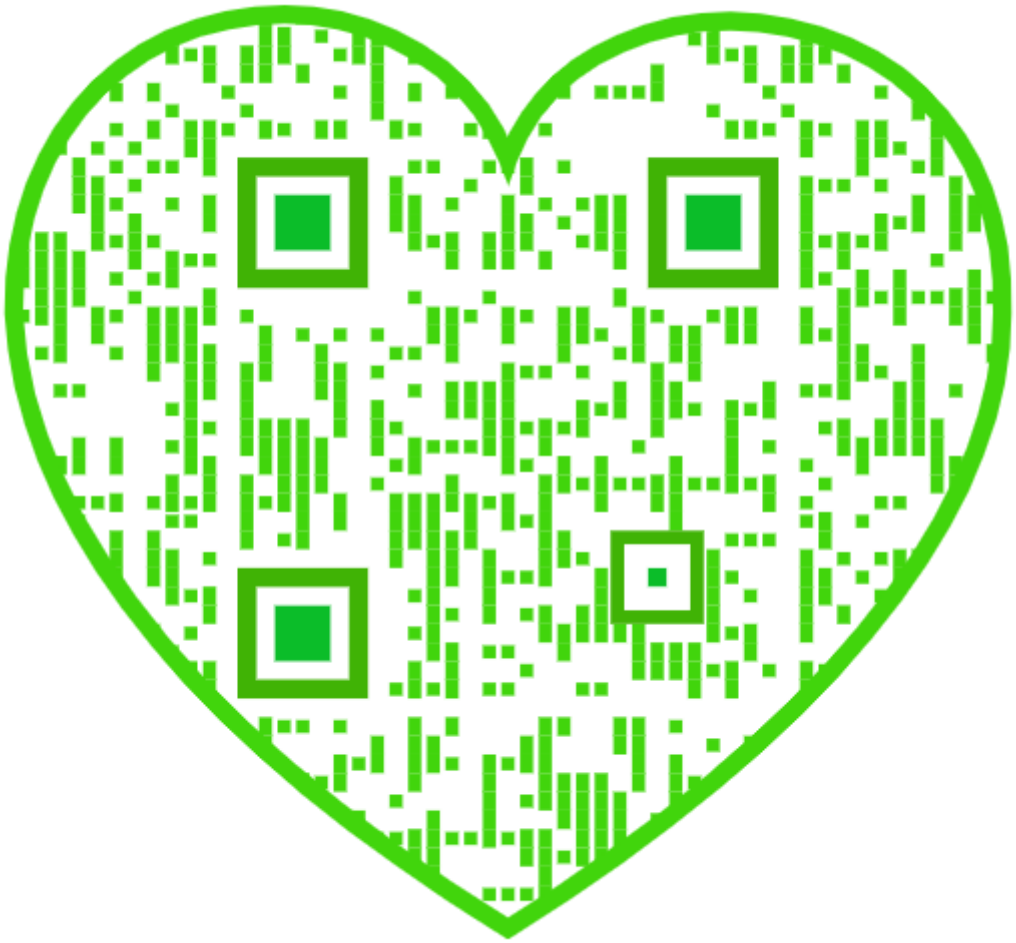

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STATE BOARD OF AGRICULTURE

SOME OF THE ESSENTIALS

OF

BEEKEEPING

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SOME OF THE ESSENTIALS OF BEEKEEPING.[1]

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Introduction.

This bulletin is not intended to be comprehensive of all beekeeping, but rather a guide to some essentials, adapted to the beginner, the avocational or the family beekeeper. Since Massachusetts already has an extremely large number of apiarists who keep only a few colonies, the special demands of the industry suggest the need of greater expertness, efficiency and larger beekeeping. There is also opportunity for a better distribution of apiaries. For instance, some localities are entirely destitute of bees, while others possess a considerable number. To be sure, some localities — Worcester County and the Berkshires — are more profitable than others, but greater earnestness and general efficiency will result in a greater and general productivity.

The Outlook.

The opportunity for beekeeping and the prospect for profit are encouraging. With the suppression and control of infectious bee diseases, which in recent years have caused inestimable loss and discouragement, a new life for the industry is inevitable. Moreover, the Commonwealth is small and markets are especially accessible. There is a dense and growing population, and the fact that it is composed partially of Europeans improves the demand for honey. The utilization of bees in horticulture, orcharding, market gardening and cranberry culture is fast becoming more thoroughly understood and practiced. Encouragement, organization of the beekeepers for the exchange of ideas, demonstrations and protection, — all these promise to further a wholesome and fundamentally important industry.

To the majority, beekeeping is mysteriously fascinating, so that "once a beekeeper, always a beekeeper," is almost proverbial. It affords recreation, a pastime for those in confining professions. But it cannot be too strongly emphasized that bees *require attention*, and this at precisely the proper time. They respond in proportion to

[1] Crop Report for September, 1911.

judicious manipulation. Thus, neglect means failure and disappointment. In contemplating beekeeping, unless willing to properly and promptly care for the colonies, the prospective beekeeper had better not undertake the venture. Perhaps the best qualities which a beekeeper acquires are punctuality and precision.

Massachusetts is suited to Beekeeping.

Any county in the Commonwealth will support bees, even sandy Cape Cod reporting profitable returns. Beekeeping in the heart of a city can hardly be expected to yield as handsomely as in the country, but even in the city it is possible for a colony to maintain itself. Apiaries of some considerable size are found on roofs of business blocks in most of the large cities in the country. Preferably, however, for the greatest results, the apiarist should know his flora, the plants which yield nectar, their abundance and their periods of bloom. Then an apiary can be intelligently located. A garden plot or an acre of clover or buckwheat does not necessarily mean big returns in honey. Bees forage on a radius of at least two miles.

Locating the Apiary.

In commercial honey production, the selection of the apiary site receives deliberate consideration. Shelter from prevailing winds, a relatively level spot, upland and not swamp, remoteness from stock or pedestrians, aside from the general consideration of the honey-producing flora or bee forage, are important. The matter of shade versus no shade in the apiary has attracted considerable attention, but without proving the advantage of one over the other. As a whole, bees thrive best in the open, but the hives should then be protected by shade boards or ventilated covers, in order to overcome the melting down of the combs or sulking or "hanging out" of the colony in excessive heat. It is usually thought that in the open bees fly earlier and perhaps gather more nectar than when colonies are under trees. Too dense shade, which results in dampness, is to be avoided.

Usually an effort is made to turn the entrances of hives from driving winds, and apiaries frequently face the rising sun or the south, and seldom the north or northwest. Stone walls, sheds, hedges, forests and orchards make good windbreaks. The old custom of building sheds open on one side, under which to keep the colonies, has been largely abandoned. Such sheds hinder the easy and proper manipulation of the hives. Arranged in groups or rows, slightly elevated from the turf, in order to overcome dampness and the intrusion of pests, the colonies may more easily be attended to than if shelved. Grass and weeds should not be allowed to obstruct the entrances.

Materials for Maintenance.

Manufacturers present a large variety of hives and other equipment from which the beekeeper may choose his type of hive and the accessories. Not. everything advertised is necessary for a small apiary. It is advised that hives and fixtures be purchased, rather than made at home, at least for a start and a pattern, in order to secure accuracy of measurements and interchangeableness of parts. Nothing is more annoying than to have misfits. For a similar reason the advisability of selecting and continuing one type of hive, say the ten-frame Langstroth, cannot be too strongly emphasized. The prospective keeper of bees should secure a collection of supply catalogues, study them, gain acquaintance with their technicalities, and then, selecting the type of hive most to his liking, purchase an equipment. Few parts and simple construction are features to be sought. The disadvantage of the old-fashioned box hive being so apparent to any one contemplating beekeeping to-day, it is scarcely necessary to say that only equipment with removable frames and combs should be considered.

Aside from the body of the hive, in which the frames are hung and the brood raised, hence called the brood chamber, there is a bottom board, with entrance for the bees, super or upper body in which surplus honey is stored and removed, and a cover. The bottom board is recommended to be of ⅞ inch stock, in order to secure rigidity, reversible, and should have a full width entrance. Those which are reversible, giving both a shallow and a deep entrance, are convenient. Most of the super types on the market to-day will serve. The purchaser must determine, however, what the nature of his honey product is to be, then select his super, remembering to look for simplicity of construction. For a cover, the writer has been particularly pleased with metal roofed covers, consisting of a thin, inner board and a telescoping, metal-roofed outer cover. This is ventilated, water proof, ridged and durable. There is no danger of overheating the bees when it is used. There is also little danger of this cover blowing off.

In order to prevent the queen from going above to lay in the supers, or compartments where the surplus honey is stored, a thin board, with perforations which permit the passage of worker bees but prevent that of the queen, is desirable. This is termed a queen-excluding board. The modern wire construction is admirable. A similar board in which is fitted a metal device, the Porter bee escape. when placed beneath the super, will allow the bees to pass from this surplus compartment but not to return. Thus the honey can be removed with little labor. It is spoken of as a bee-escape board.

Selecting the Type of Hive.

The majority of beekeepers, especially large commercial producers, use the Langstroth hive, invented in 1851. This may contain eight or more frames, the present preference being for the ten-frame capacity. Furthermore, it is desirable to secure the new, 16¼-inch dimension hive body, permitting the use of ten frames and a division board, which follows after and confines the frames.

The Use of Foundation.

Experience shows that too few beekeepers, in this State at least, appreciate the advantage of using foundation, which is merely a basis for the construction of true and perfect combs. Foundation is composed of pure beeswax; *it is not artificial comb.* It is merely a sheet of wax in which the shape and dimensions of worker cells are impressed. Foundation, when given to the bees, is drawn out by them and elaborated into combs uniformly of worker cells. In naturally built comb there is a well-defined tendency in bees to construct a high percentage of drone cells. An excess of drones in the hives is to be guarded against. A further and important advantage is, that each comb constructed on full foundation in frames, may be removed without damage to itself or the adjoining ones. Remember, too, that according to various estimates, from 10 to 20 pounds of honey are consumed by bees in producing 1 pound of comb.

Of course, it is essential to use but a half-inch strip of foundation in the tops of the frames when treating for disease, but the combs constructed may be removed later and full sheets of foundation substituted.

Beekeepers are urged to use full foundation whenever possible; it will prove economy in the long run.

Other Equipment.

In so old a State as Massachusetts it hardly seems possible that any one should attempt to maintain bees without a smoker. It is an indispensable instrument, without which, at times, most bees cannot be handled. Buy a strong, modern smoker, of good capacity and standard pattern. They cost less than a dollar and will serve for years.

The beginner in beekeeping should not brave the attacks of his bees by failing to use a veil. Cloth veils, made of cotton tulle, or the wire-constructed Muth pattern, if properly worn, are bee proof and comfortable. The supply merchants also furnish inexpensive gloves, which not only protect the hands but give a beginner added confidence.

In order to pry apart fixtures and scrape away refuse propolis,

a hive tool should be constantly at hand. This can be purchased at a small cost. An inflexible putty knife is excellent.

Other almost indispensable apparatus can be listed and studied from catalogues. For fastening foundation to the wires in the frames, see wire embedders. For securing foundation in the surplus honey boxes or sections, study foundation fasteners, some of the recent, inexpensive types proving admirable. A few queen cages, for introducing, are serviceable, but may be constructed at home. A German bee brush, some perforated zinc, feeders, Alley drone traps, honey boards and Porter bee escapes will be useful.

Getting the Bees.

Getting the bees is easy, but there are several necessary precautions. Commence on a small scale for the first year and increase in proportion to experience. Increase, swarms will come fast enough; sometimes it is a serious problem to know how to prevent building up too large an apiary. Usually beginners find it desirable to have not more than three to five colonies. With a beginning in May, which is a suitable time of the year, frequently the apiary will have doubled by fall, giving in addition a surplus of honey.

The primary precaution, at present, in buying bees is that they be healthy or free from brood disease, a subject referred to under "Hygiene of the Apiary." The question immediately arises, "How am I to tell that the bees are not diseased?" It may be possible upon inquiry to purchase colonies which have been inspected and pronounced healthy. Sometimes an experienced beekeeper can be procured to pass judgment. Furthermore, in case of doubt, if a sample of the brood be sent to the Bureau of Entomology, Washington, D. C., or to the writer, an examination will gladly be made.

A relatively safe way to secure bees is to take a clean and equipped hive to a beekeeper, instructing him to introduce a large, early swarm. This is an inexpensive means of securing a good, vigorous colony.

Colonies may sometimes be caught in the woods by setting out empty hives. Various baits are used. A hive previously occupied by bees is attractive to swarms, but this method of securing colonies as now practiced is objectionable, and should be discontinued. Inasmuch as empty combs and sometimes honey are used as bait, there arises great danger of spreading infection through robbing. Beekeepers are, therefore, warned against a possibly unlawful act.

In purchasing a hive of bees it will be most advantageous to secure them in the movable-frame type of hive, which the prospective buyer should previously have selected as his standard. A beginner is advised not to purchase colonies in boxes, kegs or old-fashioned box hives, which requires practice in order to transfer the colony to a frame hive. This, while it affords excellent experience, is a handicap and is usually expensive.

Summing up the suggestions for a beginning: —

Purchase disease-free and strong colonies, preferably good Italians, and in the modern type of frame hive which has been decided upon. A favorable time of the year to commence is in the spring. If it can be arranged, allow an experienced beekeeper to attend to transportation, a problem which sometimes perplexes the veteran.

Italianize.

The various races, types, strains or varieties of bees, such as Carniolan, Banat, Caucasian, Cyprian, the African races, and some of the Italian strains have been much and often over-exploited. An eminent German authority has aptly said that the Americans are so anxious to try new races, they import so many strains, that they have no truly efficient, strictly American honey bee, which may be said to be characteristic of or adapted to any one locality of the United States.

In Massachusetts this is perhaps especially true, because of the many who keep bees from general, natural history or avocational interest. The serious beekeeper, however, in the Commonwealth, as elsewhere, prefers the Italian or "hybrid" (German (black) and Italian cross). Even among the Italian stock, which is widely admitted the best race, all purposes considered, there are varieties which are less desirable than others. "Hybrids" should be abandoned for pure Italians.

As a whole, Italians which are less susceptible to European foul brood are good honey producers, prolific, gentle, easily handled, not excessive swarmers, hardy and the bee for the professional. Massachusetts beekeepers are urged to Italianize, if for no other reason than the tendency of Italian strains to resist European foul brood. Generally, the so-called "leather-colored" Italian is preferred to what has been termed "golden" or the "light-yellow colored" types. If you find a good strain keep it and rear new stock from it.

With the slight labor of a few minutes spent in introducing a queen, colonies which are vicious, hybrid or unproductive, may be completely restocked and transformed in the course of a few weeks, since the life of a working bee is approximately forty days. Thus an undesirable race may be changed for prolific, gentle Italians.

Requeening.

The success of a honey crop depends upon young and vigorous bees, and their presence is now considered a most important factor in the elimination of swarming. The commercial apiarist would requeen at least once in two years; many requeen annually. By requeening in August, the wintering ability of the colony is increased, the tendency to swarm the following spring is reduced, and productiveness and efficiency in the summer are secured.

Purchasing Queens.

Queens may be purchased from early spring (in the south) to late fall. Usually Massachusetts beekeepers can secure stock raised in the State, there being at least four commercial queen rearers. Queens so secured are mated, and, consequently, introduce new blood into the apiary. They are transported by mail in a small wooden cage which also serves as an introducing cage. Directions accompany each queen. Their trade classification is as follows: "Untested;" a mated queen but unproved, her progeny not having been matured. "Tested;" the purity of the mating of this queen has been proved by her progeny. "Select tested;" these queens are usually older, and have proved themselves prolific, truly mated, etc. "Breeding queen;" such queens are carefully selected for superiority and characters worthy of being propagated. The cost of queens increases proportionally to this classification.

INCREASE.

Naturally, increase and dissemination of the species are accomplished by means of swarming, yet it is no longer considered an index of prosperity. In this thrilling event, the wildest and most exciting situation in all beekeeping, the parent stock, 20,000 strong, issues from the hive to form a new colony, leaving the brood and emerging bees, with queen cells and honey, behind, to continue the old one. The act of flying forth, the issuing of the bees with their parent queen, is called swarming. Eventually they find a new location and establish their new home. Thus one stock produces two, these two may give two more, and so the apiary grows.

Artificial or Controlled Increase.

The old way of securing more colonies was based precisely upon this natural behavior, — swarming. The beekeeper trusted to luck that his bees would swarm and not fly away. But experience has shown it uncertain. Usually the parent colony yielded little or no honey the year that it swarmed. Later, beekeepers commenced to divide their colonies, brood and bees, into two or more parts or nuclei, supplying each division with a queen or allowing the bees to rear and mate one. Gradually these small colonies or nuclei strengthen until fall, when they should become full size. But this means usually affords merely increase. Moreover, these nuclei require considerable attention, nursing and feeding, which means little economy.

The modern methods of increase are based on an effort to keep strong both the old and the new colony, without the sacrifice of the honey harvest.

Shaking for Increase.

This has virtue not only in increase but also in overcoming the swarming nuisance. The principle has many modifications and is commonly explained under heading of "shook" swarming. Here, again, the natural impulse of the bees to swarm is taken advantage of. A hive is prepared as for hiving a swarm, that is, an empty hive is equipped with frames containing either full sheets of foundation or foundation starters. This is set on the stand in place of the colony to be shaken. The readiness of the colony is determined by its preparations to swarm. A frame of sealed brood, from the old colony or elsewhere, is set in the center of the new hive. The queen is then placed on this frame. A majority of the bees are next shaken from their old combs which, when completed, will have stocked the new one on the old stand. The old hive, combs and the remaining bees (enough should be left to care for the brood) is set on a new stand. The newly formed colony will recover and build up rapidly, being almost immediately ready for supers, which should be placed over a queen-excluding zinc. This is done to prevent the queen from laying in the section boxes. The colony from which the bees have been shaken may be allowed to rear their new queen, or, more preferably, a cell, virgin queen or mated queen may be provided them, at the beekeeper's discretion. A laying queen, of course, builds up the colony more rapidly.

The experienced beekeeper can readily see how this procedure can be used to advantage in treating for brood diseases of bees. Of course, it is necessary to modify the method, using only half-inch starters of foundation (strips one-half inch in width), and omitting to put the sheet of brood into the new hive. Without brood in the new hive, a queen guard, perforated zinc, or Alley trap should be put over the entrance, in order to prevent the colony from absconding. The exchange of supers should also be avoided.

Another method, which is quite as satisfactory, is to establish a new colony by the removal of frames of hatching brood with adhering bees from several colonies. These, in a hive to which a queen is introduced, rapidly establish a thrifty colony without materially reducing the parent stocks. The force of bees can also be increased by substituting this newly formed colony on the stand of another strong colony and thus catching the returning field bees. The loss to the populous colony which was removed is slight. After moving the new colony in this way several times, remarkable increase in strength can be obtained. Such procedure, or the transferring of combs from hive to hive, in any case should be rigidly avoided in any apiary where the presence of brood disease is suspected.

The reader is also referred to the method, recommended by the

late E. W. Alexander, which is gaining much favor. This is virtually a modification of the "shook" swarming method, but without the shaking.[1]

Spring Management.

The honey harvest depends upon correct management of your colonies in the spring. Spring conditions depend upon success in wintering, and it is said wintering depends upon preparation the previous season. But with the first flight of the bees, when trees are beginning to swell their buds, the beekeeper's season commences.

Each colony should be thoroughly overhauled, provided, of course, that spring has really come. Opening colonies when bees are not flying should be avoided. A great deal of labor for the bees can be saved by scraping from the bottom boards the winter's accumulation of débris. At this season the beekeeper should scrape the top bars of the frames, remove surplus bee glue (propolis), that the parts may handle more freely during the rest of the summer. Also look for your queens, which sometimes fail to survive the hardships of winter. The presence of brood or eggs should be a guide. If there seems to be a failure of the queen, or if she is lost, a new one should be provided immediately, or else the rapidity with which the colony may dwindle will be surprising.

The honey stores, as the colony expands brood rearing, vanish almost mysteriously. Consequently it is imperative that provisions be constantly available. Remember, too, that very little nectar can be gathered in the field, since perhaps maple and skunk cabbage are the only flowers yet open. It is frequently desirable and necessary to feed. (See "Feeding.")

To know what to do with small or weak colonies is often a problem. They had better be united, a queenless one with a queenwright, some advise. To nurse along a weak colony means care, which is not always repaid by a surplus of honey.

E. W. Alexander has given a method of building up weak colonies in the spring. Those who have tried it do not all report it a success, but the writer's experience is favorable. Beekeepers should undertake it with caution, but nevertheless surprising results have been obtained.

According to Alexander, the apiary should be divided into an equal number of strong and weak colonies. Again, mark each of the weak colonies which has brood. Placing queen-excluding zinc over the strong colonies without disturbance, and, preferably, without smoke, set the weak colonies having brood over strong ones. It will be necessary to give a frame of brood to each of the weak

[1] "A B C and X Y Z of Bee Culture," Root, 1910, pp. 284, 285. "Gleanings in Bee Culture," 1906, p. 423, or in "Alexander's Writings," published by the A. I. Root Company.

colonies having none. These may then be set upon strong colonies, in each case using a perforated zinc between the upper and lower hive, as before.

Alexander's caution is: "In every case where the method is reported a failure it has been from one of two causes, — either lack of brood in the weak colony, in order to hold the queen and her few bees in the upper hive, or smoking the strong colony so that, as soon as the weak one was set on top, the bees rush from below and sting every one above. Therefore, avoid using smoke or doing anything to excite the strong colony." The whole should be done so that neither colony realizes that it has been disturbed. In about thirty days each hive will be crowded with bees and maturing brood. Then, when you wish to separate them, set the strongest colony on the new stand.

A further spring duty is to clean up the apiary. As is explained under "Hygiene of the Apiary," on the first day that bees fly examine each hive and determine whether it contains a living colony. *Immediately,* close bee-tight any hive in which the colony has died; furthermore, remove the hives and contents to a bee-tight building. This is not only a wholesome practice to prevent robbing, but it is vital in order to check the spread of diseases. For a similar reason beekeepers are warned against *exposing any comb, honey or section* so that the "bees may clean it up," as is so thoughtlessly done.

Contraction of the entrance is a matter of judgment. As a general rule, never give more entrance than can be guarded by the bees within; this is especially applicable in spring and fall. Entrance contraction as is erroneously and frequently thought, is not of so much importance in controlling ventilation as in reducing or preventing robbing.

Weak colonies benefit in the early spring by being outwardly protected. Outside cases of wood or paper coverings, used as winter protection, are of much service in early spring, when a high temperature must be maintained for brood rearing..

Feeding.

Usually, bees can exist without being fed extra stores. There are advantages, however, in judicious feeding. This may be accomplished in different ways and for different purposes. At present, as a general rule, it is not safe to feed honey, there being too grave danger of transmitting brood disease by it. On the whole, sugar is not only safer and more preferable but cheaper. When necessary, honey may be *diluted* with an equal amount of water, *boiled one hour in a covered vessel* and fed.

Spring Feeding.

Usually, enough stores can be provided in the fall to last until a honey flow comes in the spring. Moreover, feeding is always stimulative to egg production and brood rearing. Consequently, when it is done in the spring a thin syrup made from the best granulated sugar, one part of sugar to two or even three parts of water, may be used. Small amounts, a pound or two daily, are usually sufficient.

Fall Feeding.

In the fall, the purpose being merely to supply winter stores, feeding is done as rapidly as possible. In considering the wintering problem, emphasis is placed on the necessity of ample and naturally stored supplies; therefore, feeding should be completed early in October. At this season there is no desire to stimulate, and a thick, saturated solution of granulated sugar is used.

How to Feed.

There are many devices on the market for feeding, most of them having merit and some particular convenience. They may be listed: Cary, Danzenbaker, Paige, division-board, pepperbox or Boardman (slow or small feeders), and Miller (a rapid feeder). These may be seen pictured in the catalogues. On the whole, an entrance feeder is to be avoided, since it excites robbing unless cautiously used.

Tin Pan Feeder.

This is perhaps the most satisfactory, inexpensive and sanitary feeder in use. A tin pan is filled with excelsior and placed in an empty super above the brood chamber. When filled with syrup, the excelsior affords a footing for the bees, so that few drown, drowning being an objection to some other feeders. Furthermore, dry sugar may be placed in the pan and merely dampened with water, supplying an excellent slow feed. When desired, the pans may be scalded and sterilized. There is no checking of the wood, nor breaking of glass; they telescope and pack away, and their cost is but 5 or 10 cents each.

Mixing Syrup.

Usually it is not necessary to boil syrup if mixed in advance and thoroughly stirred (an extractor is serviceable for 50 pounds or more of sugar). If hot water is used, it is an advantage. There are two precautions, however. Never feed scorched syrup, since it is fatal. There are cases, also, where feed has stood in galvanized tanks, as in an extractor, and has been found upon feeding to be poisonous to brood, especially in queen rearing.

Pollen Substitutes.

Whether we have yet found a substitute for pollen is a question. Some authorities advise placing bran, rye flour, pea flour and other similar materials where bees can gather them in the early spring. No objection or particular advantage in the practice has been observed.

WINTERING.

One of the most formidable obstacles in the industry is wintering. Among those who practice the "let-alone" method of beekeeping, the mortality in winter and early spring is high. Unfortunately, no accurate studies of the best conditions for wintering have been made, yet failure may frequently be attributed to starvation, too small colonies as a result of late swarms, old queens which fail to survive or build up the colony in spring, or to the lack of a large population of young bees reared in the fall, which are to survive as workers the following spring.

Bees pass the winter in what may be termed a winter nest. They do not hibernate in the strict sense of the word, but cluster densely on the combs, maintain a relatively high and constant temperature, and consume honey for the purpose of heat production. Several months are sometimes passed without their leaving the hive, but upon the first calm warm day of spring, when the mercury reaches 45° to 50° F., they break clusters and fly forth, relieving themselves of excrement which they have retained rather than deposit in the hive. Having usually ceased brood rearing in October or early November, this is resumed in the spring, sometimes as early as February and usually in March.

Based on an understanding of normal conditions and behavior, it is evident that certain precautions by the beekeeper can materially further successful wintering. Perhaps the most important are plenty of provisions naturally arranged or stored early in the fall, and accessible to the cluster in winter; a large population of young, vigorous bees, reared late, which survive to become workers the following spring; a young prolific queen, preferably of the previous summer's rearing; and rational outward protection to the hive.

The methods of feeding are already discussed. This should not be delayed later than the first of October, to allow the natural and proper storage of the provisions. According to the size of the colony is the winter consumption. On the average, 35 pounds are consumed by colonies wintered out of doors, and bees, stores and hive fixtures should weigh approximately 50 pounds in the fall. Colonies light in naturally gathered provisions should be provided a balance of thick, fall-feeding, sugar syrup. Cellar-wintered colonies consume less than half as much provisions.

Normal, populous and provisioned colonies often do as well, or better, without packing and protecting. A common winter covering is the banking of a hive in straw, leaves or litter. An outer case, with an air space between it and the hive, has more merit. The air space is sometimes filled with insulating material, such as cork, shavings or chaff, but this practice is frequently considered by practical apiarists as the cause of too much condensation, and, consequently, dampening within the hive during long confinement. It must be recognized that within there is a living cluster of bees, actively transpiring and exhaling, which means that moisture is given off. If there is no escape it collects and runs down over the frames and bees. A cold night may later transform it into frost. The heat of the sun does not penetrate the excessive packing, thus there is refrigeration, rather than the desired conservation of heat. To be as near normal, natural conditions as possible, it would appear as though the much practiced and liked method of wrapping hives in paper is to be preferred. Newspapers, over which is laid a waterproof building paper (some prefer tar paper), are brought down and cleated to the hive in order to prevent blowing off. Through this by day the sun can warm and help dry out the hive, and at night the heat within is retained. If desired, previous to wrapping in paper an empty super may be set over the brood chamber. In this a sack of cork chips, dry leaves or shavings may be placed so as to act as an absorber for excessive moisture. Provision should be made, however, for the free passage of the bees over the tops of the frames and beneath the cushion by laying cleats crosswise on the frame top bars.

A common error is a too great contraction of the entrance, which results in retention of moisture and ultimate mildew or mold on the combs. A strong colony should have a full width (14 by ½ inch) entrance. Weaker colonies may profit by proportional contraction by means of blocks.

In some localities field mice cause considerable damage by building nests in the hives, gnawing and eating combs, pollen and dead bees. Access may easily be prevented by placing, early in the fall, a guard, composed of ½-inch mesh wire cloth, over the hive entrance, through which the bees pass readily.

Cellar wintering requires precision in care, some equipment and experience. In a large apiary Massachusetts beekeepers will benefit by successfully wintering 95 per cent. to 100 per cent. of their colonies. The cost of a cellar will soon be overbalanced by saving in stores consumed and in the loss of colonies sometimes attending outdoor wintering. Limited space and the fact that this paper is intended for smaller beekeepers suggest that details be consulted in "A B C and X Y Z of Bee Culture," Root, 1910.

Hygiene of the Apiary.

Brood Diseases of Bees.

American foul brood and European foul brood are the names of two distinct brood diseases of bees which until recently have had little consideration in Massachusetts, yet their prevalence is proved to be general, and to have caused inestimable losses to the beekeepers and horticulturists. No one problem in apiculture is more vitally important, and yet, when understood, the most gratifying results can be obtained by treatment. It is not a crime, as some have thought, to find colonies diseased. As conditions have been in Massachusetts, the presence of disease was expected almost anywhere. It should be considered more disgraceful to allow disease to remain unsuppressed, so great are the infection and damages. Moreover, it is being demonstrated for the first time in the Commonwealth that brood diseases can be checked, that the treatment is not so radical and burdensome as has often been feared, and that whole beekeeping communities are benefiting more than they had anticipated. The earnest co-operation of every beekeeper is solicited in the interest of promoting Massachusetts apiculture.

An adequate description of the diseases, how to tell them and how to treat them, could not be undertaken in this limited space. It may be said, however, that every beekeeper should examine his brood from time to time, especially in the early summer. Healthy brood in unsealed cells is of a pearly white color, and the larva, a grub or developing bee, is curled in the cell and plump. If you do not find this appearance, but there is a yellowish, grayish, brownish or blackish and more or less shapeless mass, decayed in the cells, or if the brood is irregular, the cappings discolored, sunken and perforated, there is reason to be suspicious. A colony which fails to build up, to hold its own, which does not respond to manipulation as it should, or one which dwindles early in the summer, affords reasons for being watched. The presence of the disease is not always apparent, unless a cell by cell examination is made.

The owner of bees should consider that it is his individual duty to watch and inspect his own colonies. While the State inspectors are endeavoring to visit the beekeeper, the progress of the work can be greatly furthered by the individual's efforts. Do not delay reporting to the State Inspector of Apiaries, Amherst, Mass., any case which is suspicious. A systematic effort will then be made, not only to assist the person so reporting and his neighbors, but to check and suppress the infection throughout the locality. In this way it has been possible already to clean up whole towns and even parts of counties.

If the reader has not obtained copies of the publications on this

subject, mentioned below, they will be sent gratis. They contain the information which beekeepers need in order to successfully combat brood diseases.[1]

General Hygiene.

In traveling among the beekeepers, the most urgent need for better sanitary conditions in the apiary has been found. This is not only true in districts where foul brood is being fought, but elsewhere, and even in the yards of beekeepers of long experience. This is partially due to the fact that it is no longer possible to practice some of the methods which were formerly considered wholesome and safe, and partially to the prevalence of diseases. Without attempting to elaborate, and, perhaps rather imperatively, but with the best intentions, the more important suggestions are made for bettering conditions in the apiary and in Massachusetts beekeeping: —

Try Italian stock.

Use a smoker and veil; own these.

Transfer colonies from box hives.

Keep down the weeds and grass in the apiary.

Try to keep your colonies strong always.

Use removable frames and do not nail these down.

Contract the entrances of any weak colonies.

Examine the brood in each colony at least two or three times in the early part of the season. Learn to look from cell to cell and into cells.

Keep only as many colonies as you can attend to.

The use of full sheets of foundation and wiring of the frames will be an advantage to most persons.

Immediately, as a colony is found dead, close the entrance and remove the hive to a bee-tight building.

Under no circumstances expose old combs, sections and the like where bees can visit them. There is no economy in it; there is danger of robbing and of disease.

Treat diseased colonies as soon as they are discovered. The longer the delay, the greater is the loss or labor.

Make sure that colonies have ample stores for winter. Give them early spring attention.

Scraps of wax, bits of combs, should never be left in the apiary or out of doors, not even for an hour or so. Have a covered box, can or barrel which is bee-tight and indoors. It pays to accumulate the wax.

A limited space unfortunately excludes some fundamental pro-

[1] "Brood Diseases of Bees, their Treatment and the Law for their Suppression in Massachusetts," Bulletin No. 1, Apiary Inspection, Massachusetts State Board of Agriculture. By Burton N. Gates, Ph.D., 1910. "The Treatment of Bee Diseases," United States Department of Agriculture, Farmers' Bulletin No. 442. By E. F. Phillips, Ph.D., 1911. A list of the other government publications on disease and bees may be found in the last-mentioned paper.

cedure which might rightfully find place in this bulletin, for which the beekeeper is referred to other publications.

"Swarm control," by no means satisfactorily settled, is, however, alluded to in the consideration of requeening. "Handling and hiving swarms" is rather generally understood and discussed in most books. The time for "taking off surplus honey" may be said to be as soon as the honey is sealed or capped; yet beekeepers have individual preferences. "Increasing the honey crop" would be a profitable subject for consideration. These and other subjects could well comprise a bulletin. "The Production and Care of Extracted Honey" is treated by Dr. E. F. Phillips, Bulletin No. 75, Part 1, Bureau of Entomology, United States Department of Agriculture. The reader is urged to secure federal bulletins and to consult books and periodicals on beekeeping.

List of Bee Books.

General.

Comstock, Anna Botsford: "How to keep Bees."

Langstroth, L. L.: "Hive and the Honey Bee," 1853 (original edition); recent revised editions by Dadant.

Miller, Dr. C. C.: "Fifty Years among the Bees."

Poetical, Literary and Historical.

Edwardes, Tickner: "The Lore of the Honey Bee."

Materlinck, Maurice: "The Hive of the Bee;" "The Swarm."

Morley, Margaret W.: "Bee People;" "Honey Makers."

Technical.

Root, E. R. and A. I.: "A B C and X Y Z of Bee Culture" (an encyclopedic work for specialists and experienced beekeepers, and the most comprehensive work in English).

Hutchinson, W. Z.: "Advanced Bee Culture."

Cheshire, Frank: "Bees and Beekeeping" (two volumes, practical and scientific, fast becoming out of date, but considered an important source book).

Von Buttel-Reepen, Dr. H.: "Are Bees Reflex Machines?" (translated from the German. All of this author's papers are exceedingly important from the scientific and even the practical standpoint).

Queen-rearing Papers.

Phillips, Dr. E. F.: "Queen Rearing," Bulletin No. 55, Bureau of Entomology, United States Department of Agriculture.

Doolittle, G. M.: "Scientific Queen Rearing."

Bee Journals.

"American Bee Journal," Chicago, Ill.
"Beekeepers' Review," Detroit, Mich.
"British Bee Journal," Covent Garden, London, W. C.
"Canadian Bee Journal," Brantford, Ontario, Can.
"Gleanings in Bee Culture," Medina, O.
"L'Apiculteur," published 28 Rue Serpente, Paris (VI^{e}).

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